

PATENT SPECIFICATION (11)

1 600 743

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(54) ONE-WAY-FLOW VALVE

(71) I, BRIAN ALBERT HADDRELL, a British subject, of 214 Torquay Road, Preston, Paignton, Devon, and formerly of 6, Church Hill West, Brixham, Torbay, Devon, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 The present invention relates to a one-way-flow valve for use in a tubular conduit.

An object of the present invention is to provide a one-way-flow valve for use in a conduit, such as a pipe of a domestic hot-water system, which is simpler and can be made more cheaply than one-way-flow valves currently in use in such systems.

According to the present invention there is provided a one-way-flow valve for location in a conduit, comprising a tubular support member adapted to be fixed within the conduit, and a flexible-walled tubular valve member having an open inlet end supported by the support member and an outlet end defined by the wall portions of the valve member, the outlet end being open in use of the valve in response to a higher pressure at the inlet end than at the outlet end and said outlet end being closed by movement of the said wall portions into sealing contact with each other in response to a higher pressure at the outlet end than at the inlet end, thereby permitting flow through the valve member in one direction only when the valve member is mounted within a conduit, in which the flexible-walled tubular valve member is so formed that its walls are normally in sealing contact with each other at the outlet end along a part-cylindrical surface which is substantially coaxial with the axis of the valve member, and the tubular support member comprises a rigid tube having a part-cylindrical wall portion which projects beyond the remainder of the tube and assists in supporting the curved walls of the valve member when the latter are in sealing contact with each other.

The support member may, for example, be a ring of substantially the same diameter as the conduit which can be clamped against

one end or between adjacent sections of the conduit. In a preferred embodiment of the invention, however, the support member is a rigid tube which fits within the conduit. The tube may be externally screw-threaded, the conduit being provided with a mating internal screw-thread to facilitate fitting of the tube within the conduit. Preferably, however, the tube is provided with an outwardly projecting annular mounting flange which, in the installed position of the valve, is clamped between adjoining sections of the conduit or at one end of the conduit. A sealing washer of resilient material may be interposed between the flange and the conduit.

The provision of a mounting flange on the support member allows the installation of a valve according to the invention in any one of a number of conduits of varying cross-sectional dimensions. Such a valve could therefore be made in a few standard sizes for use with a wide range of conduits.

The flexible-walled tubular valve member may be bonded adjacent one end to the annular support, a free end portion of the valve member, defining the outlet end, extending axially of the conduit in the installed position of the valve. Alternatively the valve member and support member may be formed in one piece from, for example, a synthetic rubber or a resiliently flexible plastics material. In the latter case the support member would preferably be of sufficient thickness to be substantially rigid whilst the valve member would be sufficiently thin to be flexible-walled.

In use of a valve according to the invention, fluid flowing through the conduit in said one direction into the inlet end will extend the flexible-walled tubular valve member, opening its outlet end and allowing passage of fluid through the valve member. Provided a valve having a support member and valve member of nearly the same diameter as the conduit is chosen for a particular use, the valve will present only a slight resistance to the fluid flow in that direction. If, however, a pressure is exerted on the valve member tending to cause a flow in the opposite direction, the flexible-walled tubu-

lar valve member will be deformed to close the outlet and prevent passage of fluid through the valve.

By choice of suitable materials, a valve according to the invention may be made to operate at low excess pressures. A further advantage is the simplicity of construction of the valve of this invention, there being no hinged or relatively sliding parts which would wear in prolonged use, so that the valve should be capable of sustained and repeated operation over a long working life.

The valve according to the invention affords a degree of snap-action upon closure due to the asymmetric deformation of the wall of the valve member.

The invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a longitudinal sectional view of a valve according to one embodiment of the invention installed in a flow conduit, and

Figure 2 is an end view of the valve, in the direction of arrow II in Figure 1, on an enlarged scale.

Referring to the drawings, a one-way flow valve according to the invention is shown generally indicated 1.

The valve 1 comprises a cylindrical metal support tube 2 having an outwardly projecting flange 3 at one end, and a tubular flexible-walled resilient valve member 4 of silicone rubber. An open end inlet portion 5 of the valve member 4 is stretched over the tube 2, an end flange 6 of the valve member 4 cooperating with the flange 3 of the tube 2. The portion 5 of the valve member 4 is bonded to the tube 2, for example, by heat treatment. A major, free end portion 7 of the valve member 4 extends axially of the tube 2.

In Figure 1 the valve 1 is shown in use within a pipe 8 of a hot water system at the junction of the pipe 8 with a pipe 9. The valve 1 is retained in position by means of a standard pipe fitting generally indicated 10 which connects the two pipes 8 and 9 and clamps the flange 3 to the pipe 8. The rubber flange 6 provides a water-tight seal between the flange 3 and the pipe 8.

The valve member 4 is normally closed, with its walls in sealing contact with each other at the outlet end of the valve member. Water (or other fluid) flowing through the pipe 9 in the direction of arrow 11 into the inlet end of the valve member 4 expands the free end portion 7 of the sleeve 4 into an open position shown in broken outline at 12, allowing virtually unobstructed through-flow of the water into the pipe 8. Any excess pressure in the pipe 8, however, downstream of the outlet end of the valve member 4 tends to force the water in a direction opposite to the arrow 11, and collapses the walls of the valve member 4 together to close the outlet

end of the valve member 4 by sealing contact between these walls, preventing flow of water in the direction opposite to the arrow 11.

The free end portion 7 of the flexible-walled valve member 4 is formed asymmetrically so that when closed the walls of the valve member 4 at the outlet end make sealing contact with each other along a part-cylindrical surface 14 which is substantially coaxial with the axis of the valve member 4, the collapsed walls in the closed condition of the valve member 4 being supported by the wall of the pipe 8 in which the valve member 4 is located.

The support tube 2 of the valve is extended axially on the side towards which the valve member 4 collapses when closed, to assist in supporting the walls of the free end portion 7 of the valve member when closed.

A thimble or cup-shaped filter element 15 is located within the support tube 2, upstream of the valve member 4.

The elasticity of the flexible walls of the asymmetric valve member 4 shown in the drawings imparts a snap action to the closure and opening of the valve. Furthermore, the support given to the collapsed walls of the valve member 4 when closed enables the valve to withstand high back-pressures while closed.

In the illustrated embodiment of the invention the support tube 2 is of brass or copper but, depending on the nature of the fluid with which it is to be used, it could, alternatively, be made of some other metal or of a rigid plastics material. Similarly, the flexible walled valve member 4 could be of butyl rubber or other suitable flexible material.

WHAT I CLAIM IS:—

1. A one-way flow valve for location in a conduit, comprising a tubular support member adapted to be fixed within the conduit, and a flexible-walled tubular valve member having an open inlet end supported by the support member and an outlet end defined by the wall portions of the valve member, the outlet end being open in use of the valve in response to a higher pressure at the inlet end than at the outlet end and said outlet end being closed by movement of the said wall portions into sealing contact with each other in response to a higher pressure at the outlet end than at the inlet end, thereby permitting flow through the valve member in one direction only when the valve member is mounted within a conduit, in which the flexible-walled tubular valve member is so formed that its walls are normally in sealing contact with each other at the outlet end along a part-cylindrical surface which is substantially coaxial with the axis of the valve member, and the tubular support member comprises a rigid tube having a part-cylindri-

cal wall portion which projects beyond the remainder of the tube and assists in supporting the curved walls of the valve member when the latter are in sealing contact with each other.

5 2. A valve as claimed in Claim 1, in which the tubular support member is provided with an outwardly projecting annular mounting flange which, in the installed
10 position of the valve, is clamped between adjoining sections of the conduit, or at one end of the conduit.

3. A valve as claimed in Claim 1, in which the flexible-walled valve member is
15 formed in one piece with the tubular support member.

4. A valve as claimed in any one of claims 1 to 3, in which the valve member is made of synthetic rubber or resiliently-
20 flexible plastics material.

5. A valve as claimed in any one of the preceding claims, including a cup-shaped filter element located within the support member upstream of the open inlet end of
25 the valve member.

6. A one-way flow valve substantially as herein described with reference to and as shown in the accompanying drawings.

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COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of
the Original on a reduced scale*

